VIVEKANANDA COLLEGE THAKURPUKUR

KOLKATA-700063

NAAC ACCREDITED 'A' GRADE

TOPIC	**: MOLLUSCA**
COURSE TITLE	**: NON-CHORDATE IDENTIFICATION**
PAPER	**: ZOOA-CC2-3-P**
UNIT	**: STUDY OF SPECIMEN [MOLLUSCA]**
SEMESTER	**: 2ND SEMESTER**
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Non-Chordate Identification

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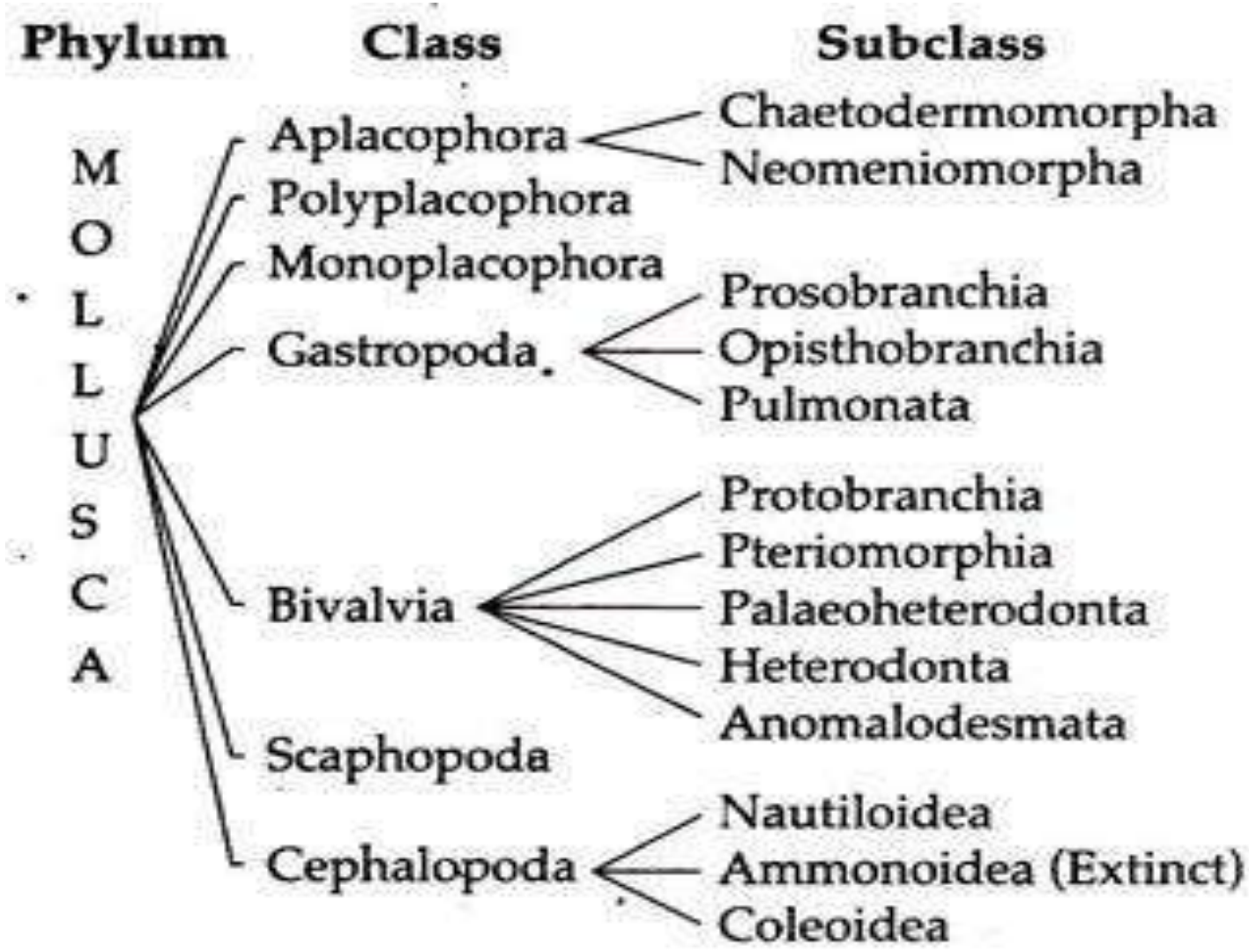
REFERNCE:

1. **Ruppert and Barnes, 1994.**
2. **Specimen Pictures are taken from the specimens of the Museum of Zoology Department, Vivekananda College, Thakurpukur.**
3. **Practical Zoology-Ghosh Manna**
4. **Practical Zoology-Poddar**

NON-CHORDATE
MOLLUSCA SYLLABUS

Chiton, Patella, Pila, Achatina, Pinctada, Dentalium, Nautilus, Sepia & Octopus

The group Mollusca, established by Cuvier (1798), comprises of almost 1,00,000 species and is the second largest animal phylum. The scheme of classification presented here is based on the classificatory plan outlined by Ruppert and Barnes, 1994. Barnes et al. (1999) has split Aplacophora into two classes *Chaetodermorpha* and *Neomeniomorpha*.



Etymology:

Latin: ***molluscus***, a soft nut or soft fungus.

Diagnostic Features of Phylum Mollusca:

1. Bilaterally symmetrical.
2. Majority are aquatic animals with a few being terrestrial.
3. Body soft, unsegmented, without a body ‘ cavity other than that provided by blood sinuses.
4. Body monomeric and highly variable, essentially with an anterior head bearing eyes and sensory tentacles, a large flat ventral foot and a posterior mantle cavity.
5. Presence of a protective external dorsal shell. In some cases, it may be internal and covered by tissue or secondarily reduced or lost.
6. The visceral mass remains enclosed by a thick muscular fold of the body wall called **mantle.**
7. A toothed, chitinous, tongue-like ribbon, the **radula** is present which assists in feeding.
8. The respiratory organs are in the form of one or more **ctenidia gills** housed in the mantle cavity and **pulmonary sacs.**
9. An open blood system with a heart enclosed by the pericardium is present, through which the intestine also passes.
10. Excretory organs include a pair of saclike ‘kidneys’, opening proximally into the pericardium and discharging into the mantle cavity.
11. Nervous system comprises of a circum-oesophageal ring and two pairs of ganglionated longitudinal cords with various modifications.
12. Sexes are usually separate, a few forms are hermaphrodite.
13. Typically with a single pair of gonads, discharging the gametes into the mantle cavity.
14. Cleavage is spiral.
15. Development indirect via trochophore and veliger larval stages or secondarily direct.

	Specimen	Systematic position
1.	*Chiton* sp.	Phylum - Mollusca Class- Polyplacophora Genus-*Chiton sp*

Class Polyplacophora:

1. Body oval to somewhat elongated and dorsoventrally flattened.
2. Dorsal surface covered by eight shell plates. The surrounding mantle forms a thick 'girdle', the cuticle.
3. A broad muscular creeping foot is present on the ventral surface.
4. Between the foot and mantle cavity, in the pallial groove lies a number of gills.
5. Head is poorly developed. Eyes and tentacles are absent.
6. Radula is large and bears many teeth.

Example:

Chiton, Loricata, Lepidopleurus, Chaetopleura.

1. Body is elliptical, dorsally convex and ventrally flattened.
2. Several pairs of bipectinate ctenidia present on either side of mantle groove.
3. Lines of grooves present on the valves.
4. Presence of labial palps on either side of the head.

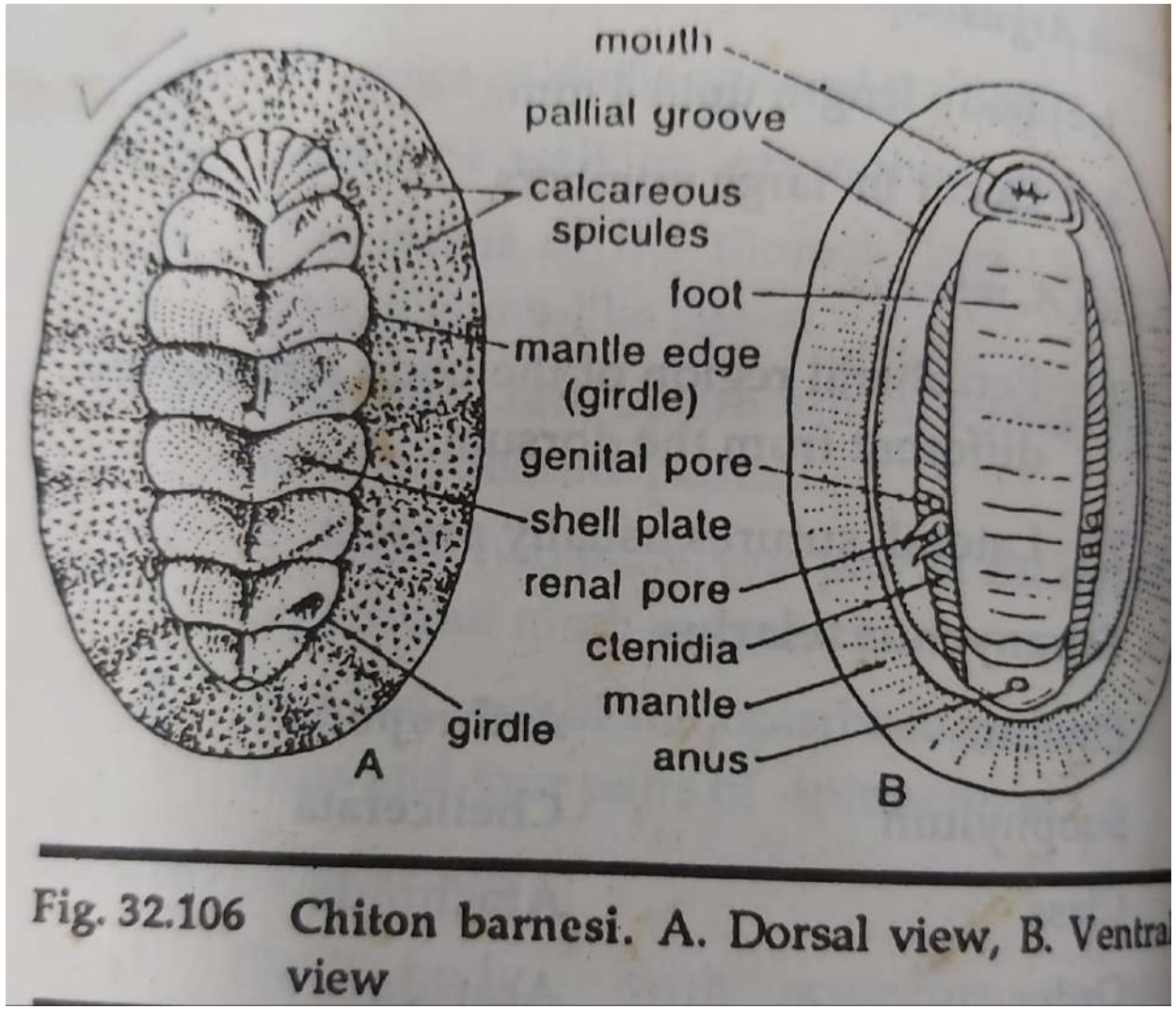


Fig. 32.106 Chiton barnesi. A. Dorsal view, B. Ventral view

- Hence the specimen is *Chiton* sp.

	Specimen	Systematic position
2.	***Patella* sp.**	Phylum - Mollusca Class- Gastropoda Subclass- Prosobranchia Genus-*Patella* sp
3.	***Pila* sp.**	Phylum - Mollusca Class- Gastropoda Subclass- Prosobranchia Genus-*Pila* sp

Class Gastropoda:

Greek: gastros, stomach; podos, foot

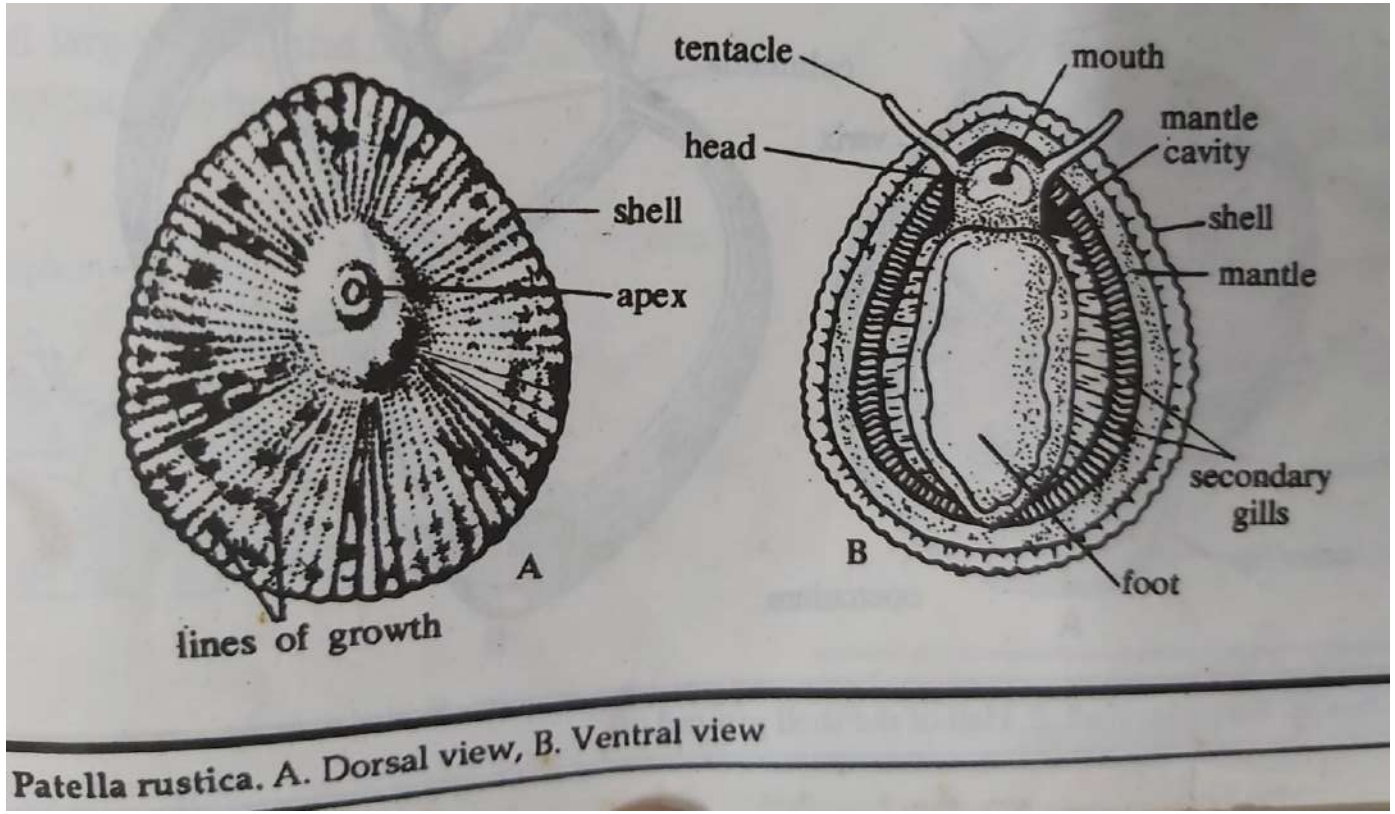
1. A muscular foot is present below the digestive system and visceral mass.
2. Visceral mass is twisted at 180° in an anticlockwise direction (torsion), relative to the head and foot.
3. Mantle cavity occupies a forwardly facing position, with the anus and kidneys discharging anteriorly.
4. Shell is in one piece and asymmetrically spiralled.
5. Head distinct with one or two pairs of tentacles and eyes. In the digestive system, buccal mass contains a scraping radula.
6. A well-developed flat, crawling foot present.
7. The mantle cavity contains a single pair of bipectinate ctenidia.
8. A chemo-receptive sense organ in the mantle cavity called the osphradium is present.

Subclass Prosobranchia:

1. Mantle cavity and contained organs are located anteriorly.
2. Presence of one or two gills within the mantle cavity anterior to the heart.
3. Shell and usually an operculum covering the shell mouth are present.
4. Nervous system forming a figure of '8' due to torsion.

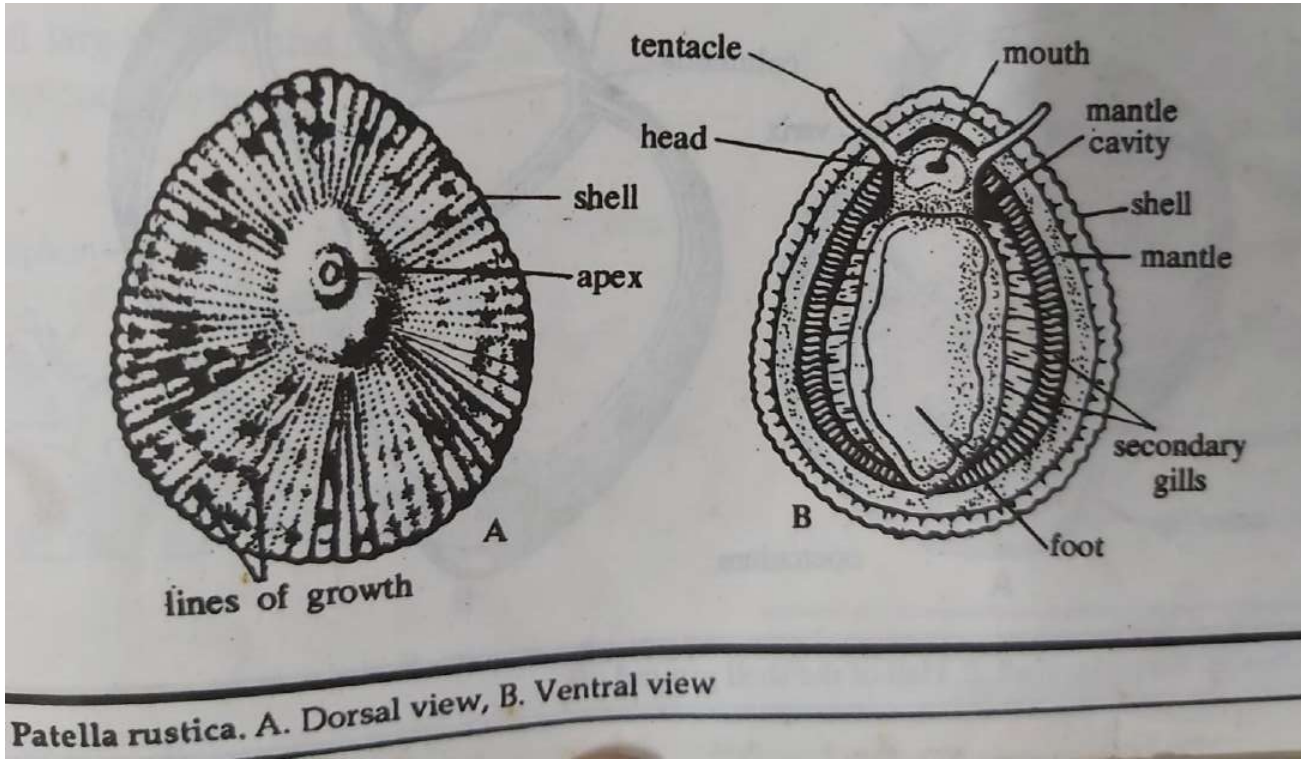
Example:

Patella, Haliotis , **Pila**, Cypraea.



Patella rustica. A. Dorsal view, B. Ventral view

1. Shell is single, dorsally placed and resembles volcanic cone bearing lines of growth.
2. Head bears a pair of tentacles and eyes.
3. Presence of pallial gills around the feet.
4. Operculum is absent.



Patella rustica. A. Dorsal view, B. Ventral view

- Hence the specimen is *Patella* sp.

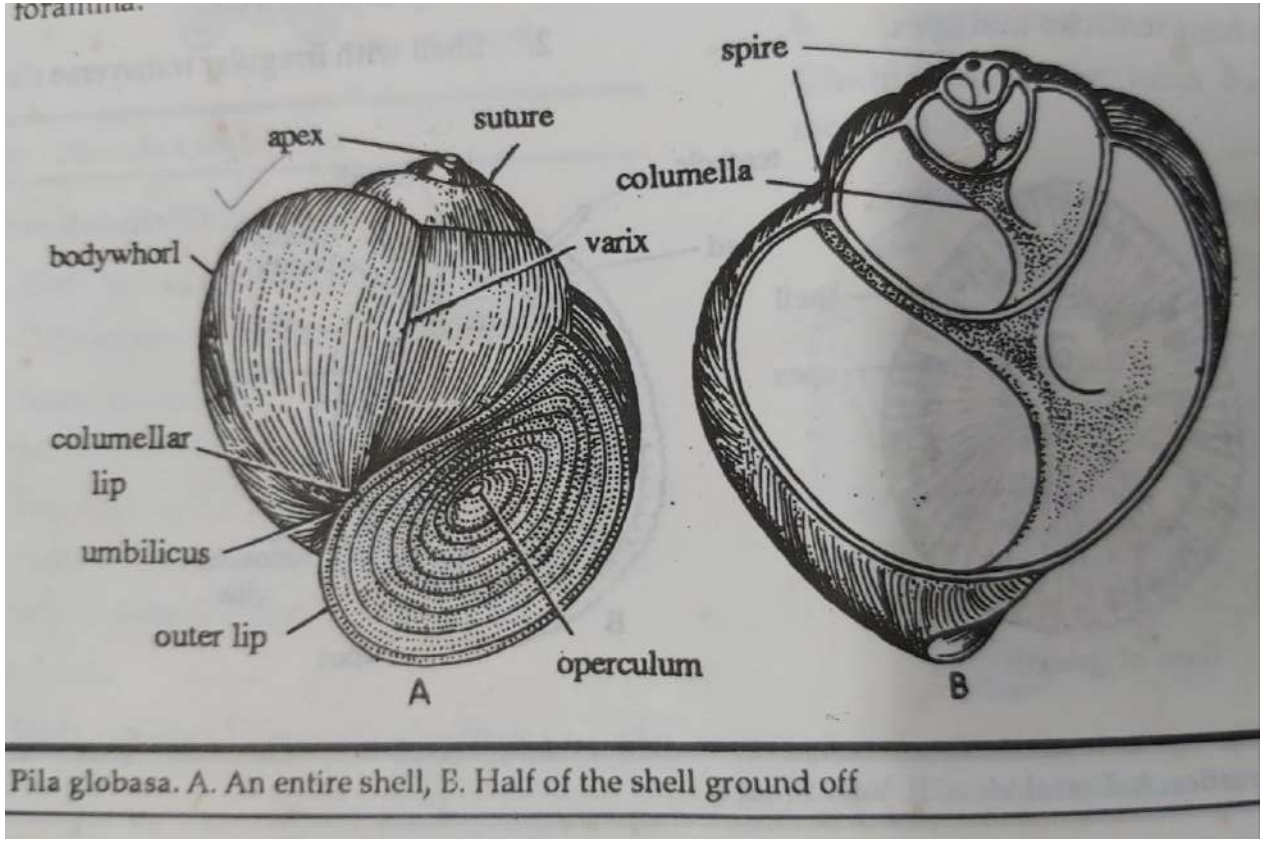
Subclass Prosobranchia:

1. Mantle cavity and contained organs are located anteriorly.
2. Presence of one or two gills within the mantle cavity anterior to the heart.
3. Shell and usually an operculum covering the shell mouth are present.
4. Nervous system forming a figure of '8' due to torsion.

Example:

Patella, Haliotis , **Pila**, Murex, Cypraea.

1. Body is enclosed in a thick, globular, univalve shell.
2. Shell surface marked by lines of growth.
3. Presence of an elliptical operculum, marked by concentric rings of growth around a nucleus.
4. Head bears 2 pairs of tentacles and a pair of eyes.
5. Visceral mass is spirally twisted.
6. Shell has 2 distinct zones-spire and body whorl.
7. Sutures on shell are deep and prominent.



Pila globasa. A. An entire shell, B. Half of the shell ground off

- Hence the specimen is *Pila* sp.

	Specimen	Systematic position
4.	*Achatina* sp.	Phylum - Mollusca Class- Gastropoda Subclass- Pulmonata Genus-*Achatina* sp

Subclass Pulmonata:

1. One auricle and nephridium.
2. Gills absent.
3. Mantle cavity on the right side is converted into an air-breathing lung with a contractile opening, the pneumostome.
4. Shell usually present but operculum lacking.
5. Nervous system concentrated and symmetrical.
6. Hermaphroditic.

Example:

Achatina, Helix, Umax, Lymnaea, Ancylus.

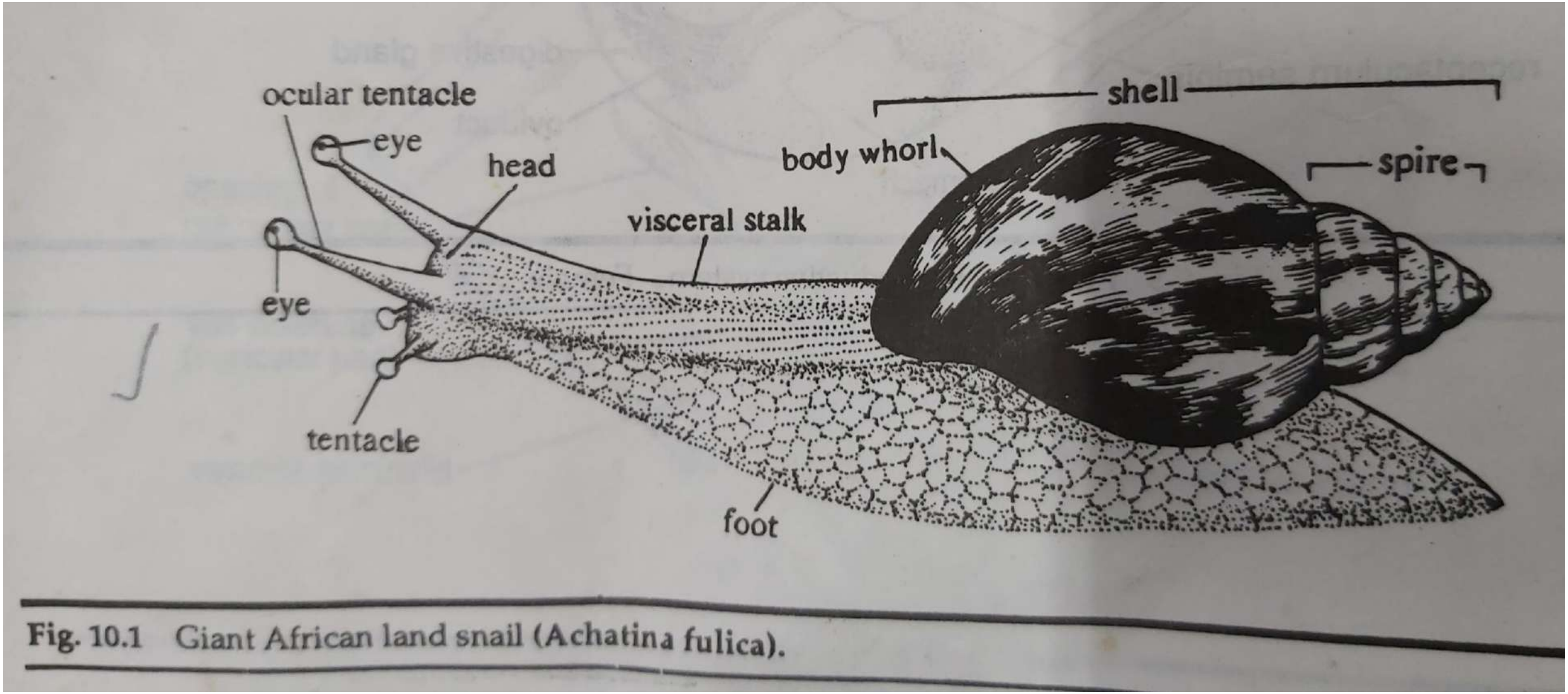


Fig. 10.1 Giant African land snail (Achatina fulica).

1. Shell is typically spiral and elongately oval.
2. Mantle cavity large and opens through pneumostome.
3. Presence of two pairs of tentacles.
4. Tip of the hinder tentacles bears eyes.
5. Reticulation on the dorsal surface of the foot.

- Hence the specimen is *Achatina* sp.

	Specimen	Systematic position
5.	*Pinctada* sp.	Phylum - Mollusca Class- Bivalvia Subclass- Pteriomorphia Genus-*Pinctada* sp

Class Bivalvia:

1. Laterally compressed body enclosed within a pair of shell valves.
2. Relatively sedentary or even sessile.
3. Head indistinct and a radula is absent.
4. Foot blade-like in burrowing species and reduced in attached forms.
5. Mouth provided with two pairs of labial plaps.

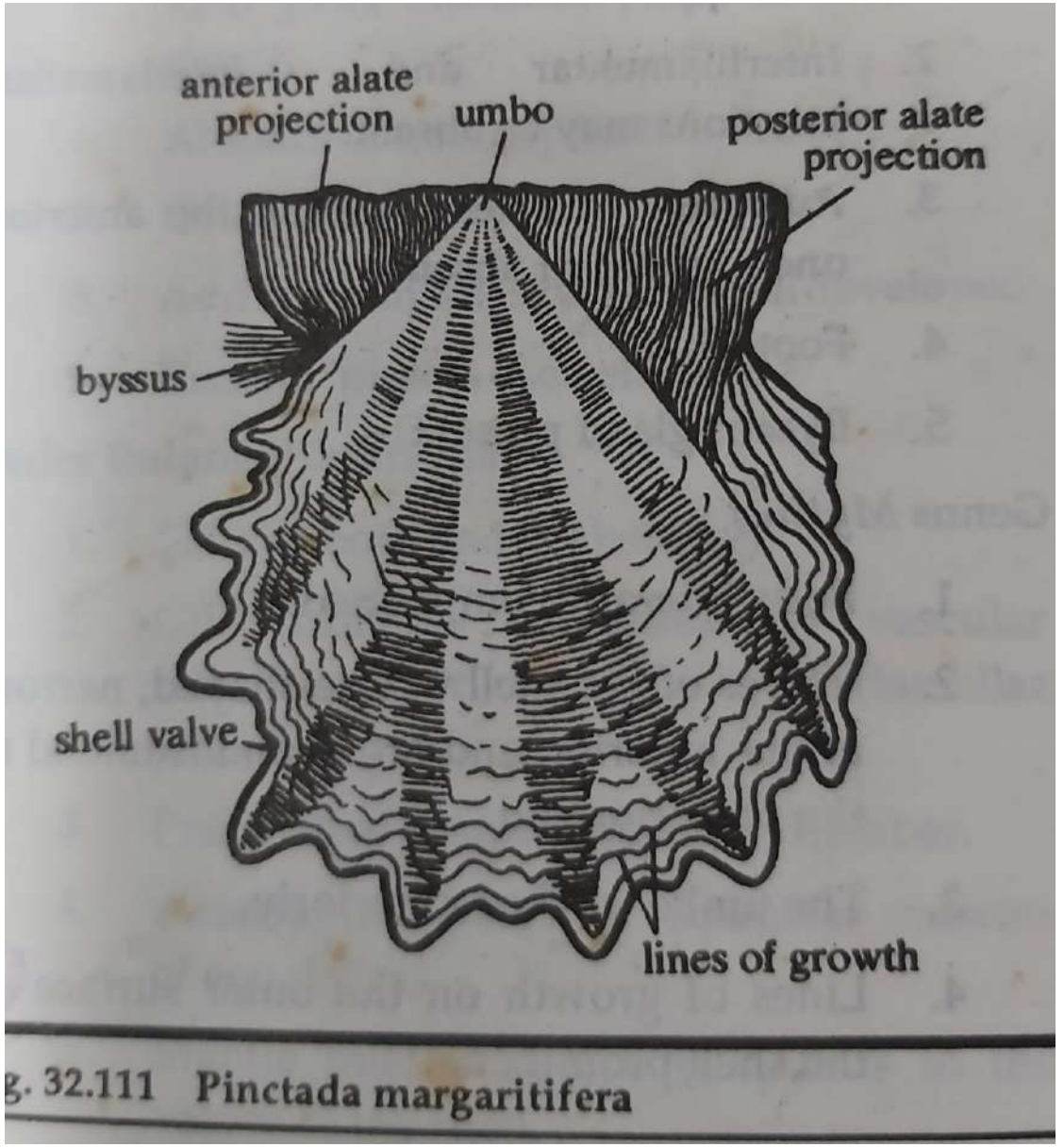
Subclass Pteriomorphia:

1. Attached by byssus threads or cemented to the substratum, some secondarily free.
2. Mantle margins not fused.

Examples:

Mytilus, **Pinctada**, Ostrea, Lima, Pecten

1. Shell surface is coarse, irregular and bears a radiating band forming finger like projections at margins.
2. Hinge lines are straight and produces 2 wing like processes at each end.
3. Right shell valve is smaller thin and covers the viscera.
4. Left shell valve is large, convex and permanently attached to rocks
5. Right and left mantle lobes free.



g. 32.111 Pinctada margaritifera

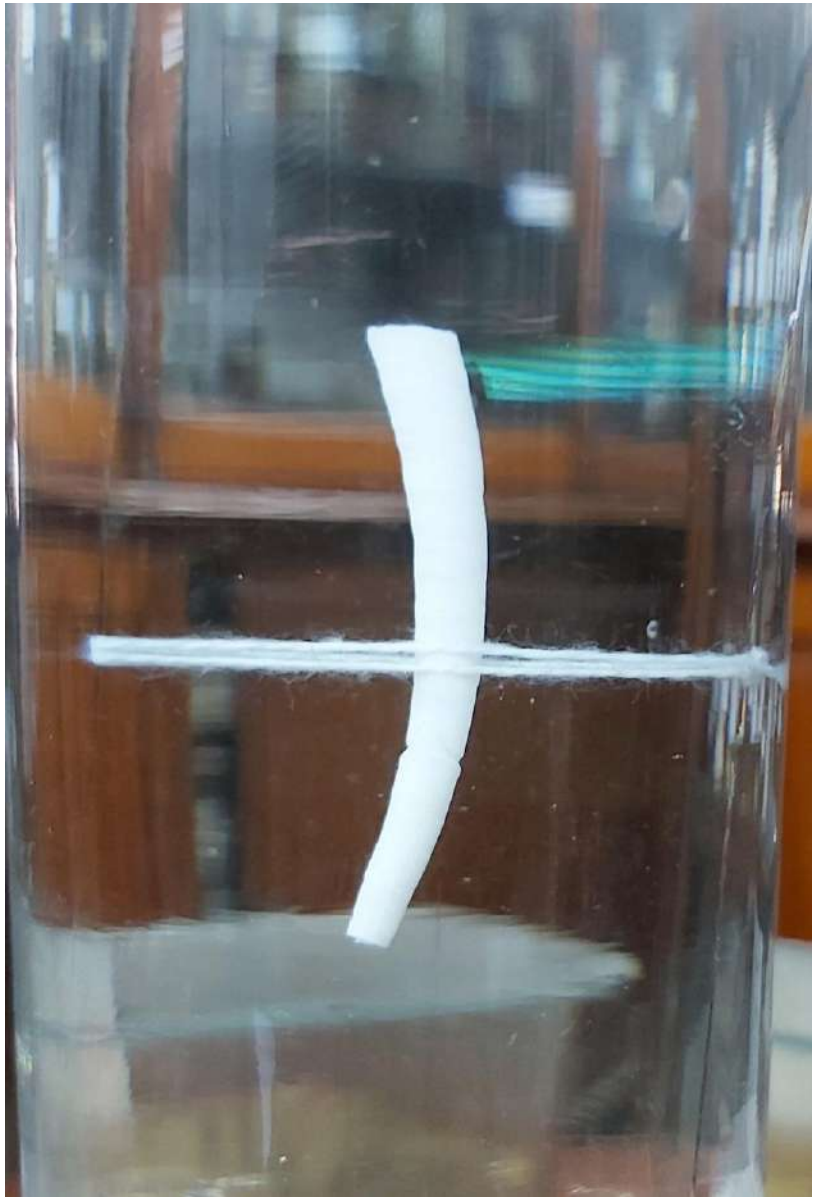
- Hence the specimen is *Pinctada* sp.

	Specimen	Systematic position
6.	*Dentalium* sp.	Phylum - Mollusca Class- Scaphopoda Genus-*Dentalium* sp

Class Scaphopoda:

Greek: skaphe, boat; podos, foot.

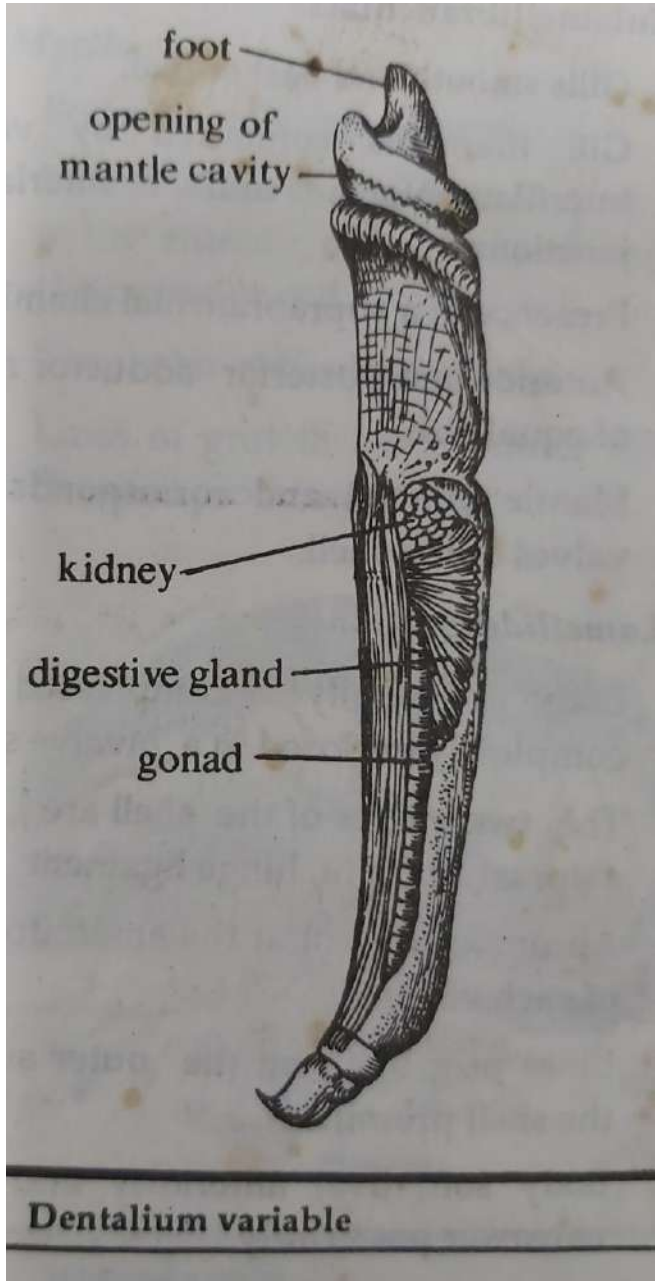
1. Presence of a tubular, tusk-like shell, open at both ends.
2. The elongated body completely enclosed by the mantle.
3. From the large ventral opening of the shell projects the conical or cylindrical burrowing foot and buccal region.
4. Buccal mass possess a radula.
5. The small proboscis-like head lacks eyes and sensory tentacles.
6. Paired clusters of narrow, clubbed adhesive, contractile filaments, the **captacula** surrounding the mouth and are used in feeding.
7. Gills absent, instead a part of mantle serves for gaseous exchange.
8. Circulatory water enters and leaves through the small posterior opening.
9. Possess a single gonad that discharges via the right kidney.



Examples: Dentalium, Cadulus.

1. Rudimentary proboscis like head on the concave side of the body.
2. Eyes and tentacles absent.
3. Captacula are filamentous with sucker like ends.
4. Foot conical narrow and trilobed

- Hence the specimen is *Dentalium* sp.



Dentalium variable

	Specimen	Systematic position
7.	*Nautilus* sp.	Phylum - Mollusca Class- Cephalopoda Subclass- Nautiloidea Genus-*Nautilus* sp

Class Cephalopoda:

Greek: Kephale, head; podos, foot.

1. Foot modified into a series of prehensile arms or tentacles and siphon.
2. Shell absent or reduced and covered by the mantle in most species.
3. This group has a well formed head bearing large eyes.
4. Mouth possesses radula and jaws.
5. Presence of a single gonad and development is direct.

Subclass Nautiloidea:

1. Presence of external shell.
2. Four ctenidia, four auricles and four kidneys are present.
3. Possess many slender, suckerless tentacles.

Example: Nautilus.

1. Shell flat and spirally coiled in one plane.
2. Chambers small, except the outer one.
3. The animal is lodged in the body whorl; other chambers are empty or filled up with gas.
4. Tentacles nearly 100, prehensile and devoid of suckers.
5. Two tentacles on the dorsal side are thick and form a hood over the mouth.
6. Ink sac absent.

- Hence the specimen is *Nautilus* sp.

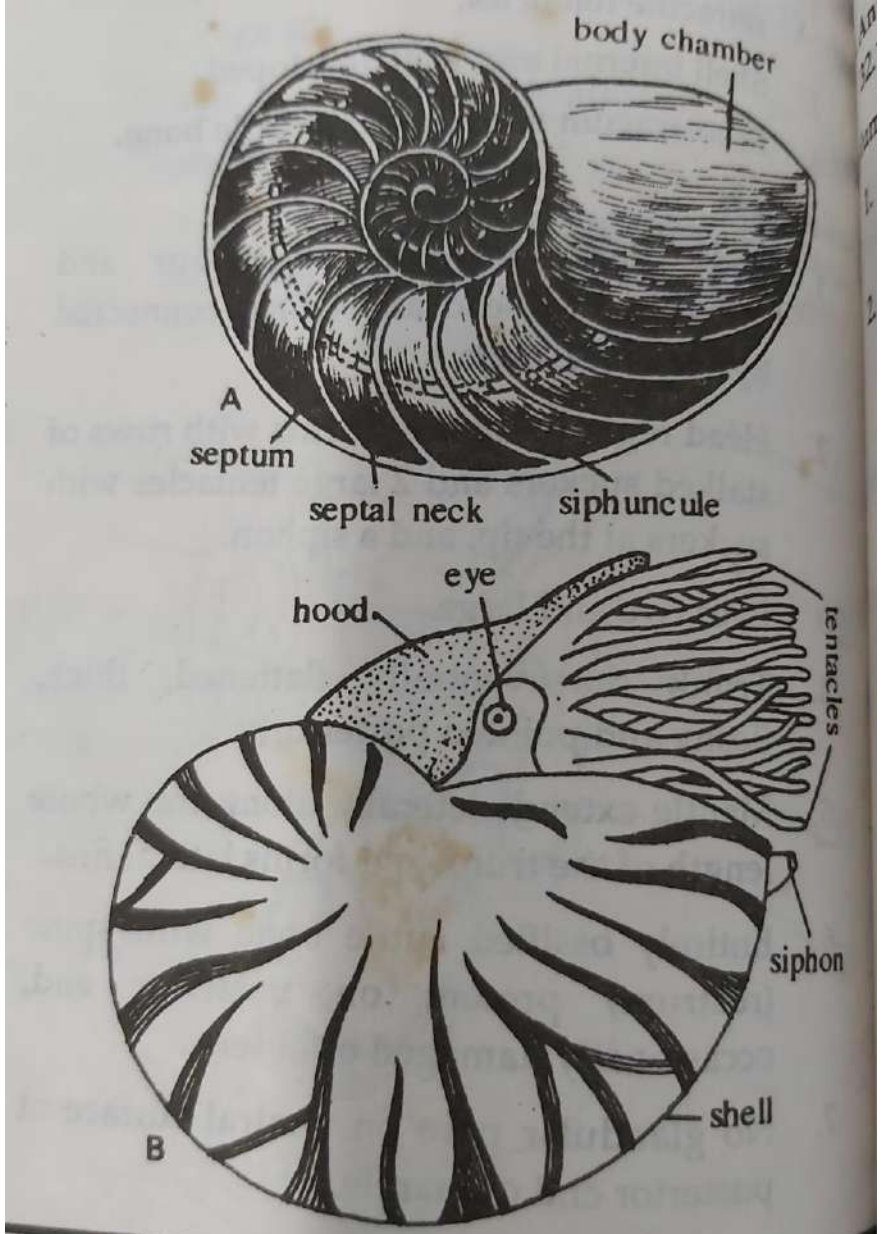


Fig. 32.127 Nautilus pompilius. A. A shell cut into two halves, B. An entire specimen

	Specimen	Systematic position
8.	*Sepia* sp.	Phylum - Mollusca Class- Cephalopoda Subclass- Coloidea Genus-*Sepia* sp
9.	*Octopus* sp.	Phylum - Mollusca Class- Cephalopoda Subclass- Coloidea Genus-*Octopus* sp

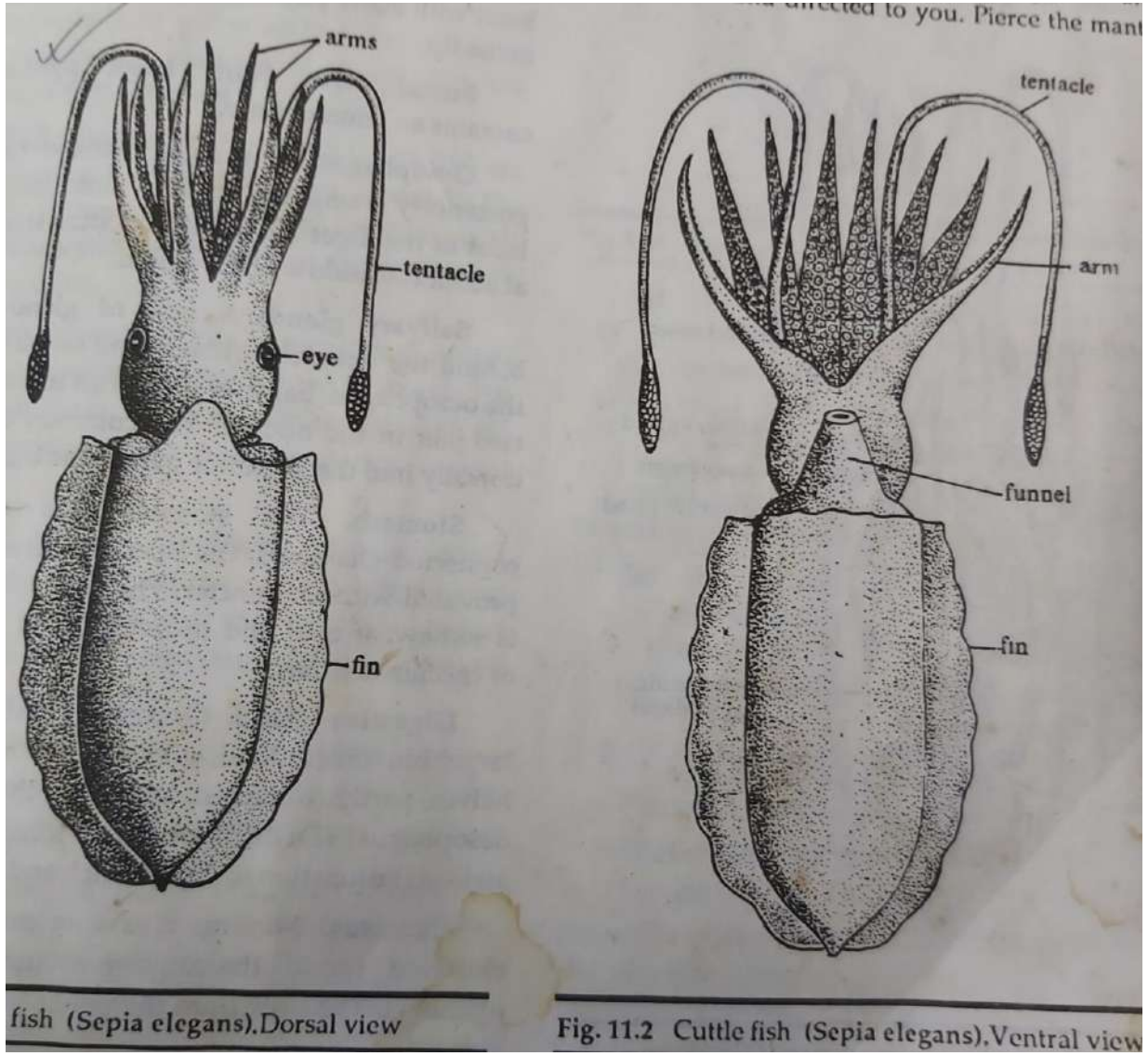
Subclass Coleoidea:

1. Shells internal, reduced or absent.
2. Presence of two ctenidia, two auricles and two kidneys.
3. The eight or ten arms bear suckers.

Examples:

Sepia, Loligo , **Octopus**, Argonauta.

1. Shell is internal.
2. Body is dorso-ventrally flattened and divided into head and trunk connected by a narrow neck.
3. Head region contains 8 arms with rows of stalked suckers and two large tentacles with suckers at the tip and a siphon.
4. Eyes two and large.
5. Mantle extends laterally along the whole length of the trunk and forms lateral fins.
6. In male, left fourth arm is hectocotylus[specialized to store and transfer spermatophores to the females.]



fish (Sepia elegans).Dorsal view

Fig. 11.2 Cuttle fish (Sepia elegans).Ventral view

- Hence the specimen is *Sepia* sp.

Subclass Coleoidea:

1. Shells internal, reduced or absent.
2. Presence of two ctenidia, two auricles and two kidneys.
3. The eight or ten arms bear suckers.

Examples:

Sepia, Loligo , **Octopus**, Argonauta.

1. Body round and differentiated into head and visceral hump.
2. Head bears a pair of funnel eyes and eight elongated arms.
3. Inner side of each arm bears two rows of sessile, cupped suckers .
4. Eyes two and large.
5. In male, right arm is hectocotylus

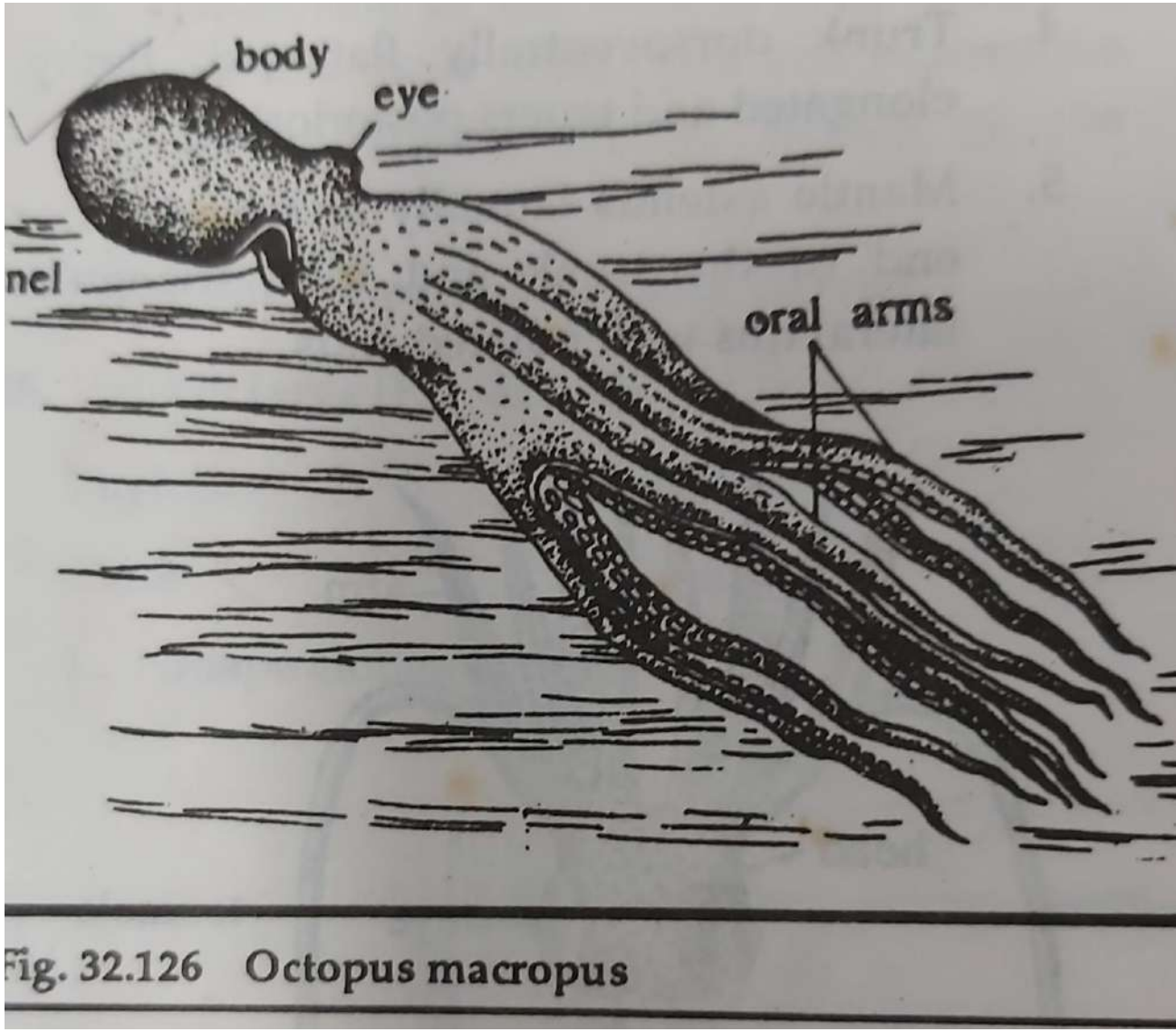


Fig. 32.126 Octopus macropus

- Hence the specimen is *Octopus* sp.

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